Year	80–2	83–4	85–6	87–8	89–0	91–2	93	P
n	1272	2435	2602	2879	3283	3416	1376	
Age	54	56	58	59	60	61	62	<0.0001
MV (%)	16	20	36	43	48	52	53	<0.0001
EF	63	61	56	58	55	55	54	<0.0001
New Dev (%)	0	0	0	0.6	7.3	16	15	<0.0001
B/D ≥2 (%)	–	–	7	12	16	12	12	<0.0001
Ang Suc (%)	86	91	84	84	90	93	93	<0.0001
Death (%)	0.1	0.3	0.7	0.9	0.7	0.7	0.7	0.018
Q MI (%)	2.3	2.4	2.4	1.9	0.9	0.9	1.0	<0.0001
CABG (%)	10	5.3	6.9	6.0	3.9	3.1	3.0	<0.0001
LOS ≥2% (%)	15	15	20	19	15	12	4	<0.0001

Patients undergoing procedures continue to get older and sicker. Nonetheless, success rates continue to improve, and complication rates fall. Mortality is unchanged since 1985 despites sicker patients. Device usage has been constant since 1991 and the number of balloons/devices per case is falling. From a resource standpoint, the most important indices of emergent CABG and prolonged LOS are decreasing. Intervention in the coronaries can be safely performed while steps are taken to minimize cost.

MONDAY PM

712 Intraoperative Transesophageal Echocardiography

Monday, March 20, 1995, 2:00 p.m.–3:30 p.m.
Ernest N. Morial Convention Center, Room 14

2:00

712-1 Intraoperative Transesophageal Echocardiography Under-Estimates the Severity of Functional Mitral Regurgitation

David S. Bach, Carolyn L. Donovan, Louis A. Brunsting, G. Michael Deeb, Steven F. Bolling. *University of Michigan, Ann Arbor, MI*

Although intraoperative transesophageal echocardiography (TEE) has been used to guide the need for valve reconstruction in patients with mitral regurgitation (MR), the effects of hemodynamic alterations accompanying general anesthesia on MR jet size are unknown. This study was undertaken to compare MR jet size before and after the induction of general anesthesia. 46 of 133 patients undergoing mitral valve surgery between 11/92 and 4/94 had TEE performed both preoperatively under IV conscious sedation (PreOp) and intraoperatively following induction of general anesthesia (IntraOp). 21 of 46 patients (46%) had degenerative mitral disease with leaflet flail (Flail) and 25 (54%) had functional MR as a result of annular dilation (Functional). The width of the MR jet at its vena contracta (Width) and the maximal jet area (Area) were determined for each patient on both PreOp and IntraOp TEE. Doppler Nyquist limits for paired studies were similar. Systolic blood pressure (SBP) and pressure rate product (PRP) at the time of MR jet measurements were available for 33 patients (72%).

	Flail		Functional	
	PreOp	IntraOp	PreOp	IntraOp
SBP (mmHg)	116 ± 17	123 ± 17	108 ± 17	120 ± 19†
PRP × 100	103 ± 97	97 ± 22†	95 ± 22	97 ± 23†
Width (mm)	1.1 ± 0.3	1.0 ± 0.3†	1.0 ± 0.3	0.7 ± 0.3*
Area (cm^2)	10.1 ± 5.2	9.8 ± 4.5†	9.0 ± 4.3	5.4 ± 3.9*

†p = NS vs. PreOp * p < 0.001 vs. PreOp

We conclude that 1) MR related to leaflet flail is adequately quantified on IntraOp TEE, whereas 2) the severity of functional MR may be significantly underestimated in patients under general anesthesia. Alteration of systemic vascular resistance independent of blood pressure may be responsible for this observation. Patients with functional MR in whom mitral surgery is considered should undergo imaging for MR quantification prior to the induction of general anesthesia.

2:15

712-2 Comparison of Transesophageal Echocardiographic and Surgical Assessment of Mitral Regurgitant Lesions: Accuracy and Incremental Value

Maurice E. Sarano, James B. Seward, A. Jamil Tajik. *Mayo Clinic, Rochester, MN*

Transesophageal echocardiographic (TEE) provides superb images of the mitral valve. In patients with mitral regurgitation (MR) the type of lesion conditions the ability to perform a valve repair, suggesting liberal indications of TEE preoperatively. However, the accuracy of TEE and its incremental value over transthoracic echocardiography (TTE) are not available to determine the proper utilization of resources. Among 347 patients operated on between 1988 and 1991 for pure, isolated MR, 248 had a preoperative TEE (age = 64 ± 14 years, 152 males) and 216 of them had a preoperative TTE. The accuracy (Ac) of TTE and TEE, the percentage of patients with incremental accuracy of TEE (% Inc) and the percentage of TTE errors corrected by TEE (% Corr) were:

	Acc TEE	Acc TTE	P	% Inc	% Corr
Etiology	99%	95%	0.008	3.7%	80%
Mechanism	99%	94%	0.002	4.6%	77%
Vegetations	99%	95%	0.008	3.7%	73%
Prolapse	93%	80%	0.001	13.9%	70%
Flail segment	96%	80%	0.001	16.2%	81%
Rupture chord	87%	57%	0.001	32.4%	75%

The % Inc was significantly higher when the anatomy was felt to be incompletely described by the observer (vegetations 15% vs 1%, p = 0.0001, prolapse 36% vs 9%, p = 0.0001).

In conclusion, 1)the high resolution imaging of TEE allows a high accuracy of anatomic assessment but, 2)the incremental value over TTE is moderate and most significant for ruptured chordae or when TTE is incomplete and thus, 3)TEE should be performed preoperatively in selected cases in which the probability for incremental value is high.

2:30

712-3 Predictive Value of Intraoperative Transesophageal Color Doppler Flow Imaging During Mitral Valve Repair

Irene M. Hellemans, Els G. Pieper, Johannes P.M. Hamer, Wybren Jaarsma, Renee B.A. van den Brink, Kees B. Prenger, Patricia F.A. Bakker, Eric Berreklouw, Jan G.P. Tijssen, Cees A. Visser, ESMIR study group (Echocardiographic Selection of patients for Mitral valve Repair). *Interuniversity Cardiology Institute (ICIN), Utrecht, The Netherlands*

To assess the predictive value of Residual Mitral Regurgitation (RMR) after valve repair for severe MR, we performed transesophageal color (TEE) Doppler flow imaging intraoperatively, after 3 months and 1 year at similar loading conditions in a prospective study of 178 patients (pts). Intraoperative grading of RMR on a 4 point scale in 159 pts showed no RMR in 77 pts, grade I in 45, grade II in 29 and grade III in 8 pts.

Univariate analysis of preoperative and surgical characteristics showed that a history of chronic lung disease (Relative Risk (RR) 1.88*), increased leaflet mobility (RR 1.50*) and normal leaflet mobility (RR 1.51*) at TEE, coronary artery disease (RR 1.38), and a Duran annular ring (RR 1.97*) were associated with an increased risk of intraoperative RMR.

In the 8 pts with grade III RMR, immediate valve replacement (VR) was advised and performed in all but one pt, who underwent VR 2 months later.

After 3 months, increase of RMR (of at least one grade) was present in 63%, reduction in 8% and no change in 29% of the pts. Compared to three months, no increase or decrease of RMR was seen at 1 year.

During the one year follow-up VR was performed in another 7 pts; all but one pt (no RMR) with intraoperative RMR grade I–II. Intraoperative RMR (grade I–II) was associated with a higher risk of VR (RR 6.51*) and thromboembolic events (RR 6.51*) in relation to absence of RMR, during this one year follow-up.

Conclusions: (1) RMR increases in most pts within 3 months postoperatively and is stable thereafter. (2) Intraoperative RMR is associated with a substantial reoperation rate and risk of thromboembolic events. (3) RMR ≤ grade II does not exclude a redo during one year follow-up.

* = p < 0.05.

2:45

712-4 Role of Intraoperative Transesophageal Echocardiography in Patients with Hypertrophic Obstructive Cardiomyopathy

Seong H. Park, Roger L. Click, William K. Freeman, Jae K. Oh, Hartzell V. Schaff, Gordon K. Danielson, Donald J. Hagler, A. Jamil Tajik, James B. Seward. *Mayo Clinic, Rochester, Minnesota*

To evaluate the role of intraoperative TEE (IOTEE) in hypertrophic obstructive cardiomyopathy (HOCM), IOTEE in 74 patients with HOCM who underwent myectomy from 1988 to 1993 were reviewed. There were 38 men and 36 women with a mean age of 45 ± 22 years (range: 2–82). All had preoperative transthoracic echo showing dynamic LVOT obstruction with a mean peak gradient of 73 ± 37 mmHg and a basal septal thickness of 25 ± 9 mm at baseline. Prior to cardiopulmonary bypass, IOTEE discovered unsuspected morphologic abnormalities in 9 (12%): subaortic membrane 1, flail mitral valve 1, tricuspid valve fibroelastoma 1, mitral valve prolapse 4, patent